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ABSTRACT

China's first national science curriculum was adopted in the 1950s from the former Union of Soviet Socialist Republics (USSR). With the rapid changes in science and technology over the past 50 years, an educational change became an unavoidable requirement. This document reviews reform movements in the following areas: (1) main problems in Chinese science curriculum; (2) objectives of the reform movement; (3) reform of curriculum structure; (4) science learning, teaching, and assessment; and (5) curriculum management. (YDS)

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Beijing, 27 to 31 March 2000

COUNTRY PAPER ON CHINA[1]

I. Background

In the early 50's, China adopted the secondary science curriculum from the former USSR. After years of localisation, this curriculum became the first national science curriculum in China. Considering the poor conditions in both education and economics at that time, the unified national curriculum played a very important role in developing teaching materials, improving teaching and teachers' training. As a result, science education developed quickly in the 50's. But for historical reasons, science curriculum developed slowly during the next 30 years. Although there has been a few changes in its framework and philosophy, it has basically stayed the same as the one that prevailed in the 50's.

With the rapid development of Science and technology as well as society and economy, basic education in China is now faced with unprecedented pressure and challenge. This kind of development makes basic education have to define more and more educational content, such as environment education, information education, and peace education. Such kind of new educational content, however, is no longer possible to be delivered in the manner of traditional subjects, as their internal relationship as well as their relationship with and influence upon traditional subjects are changing. In addition, the establishment of the concept of "lifelong learning", is fundamentally changing the aims of school education's objectives. With this background, currently the reform of curriculum design, instructional methods and curriculum system is confronted with many choices:

- Shall we stick to the traditional models of subject division, or shall we abstract new information and content based on the need for the development of society, science and the need for the multiple development of students, and organise new educational content in accordance with principles of balance, comprehensiveness and selection;

- Shall schools continue to maintain the total control of learning content and learning styles, disregarding the strong influence of educational content outside

[1] This document is the result of the amalgamation by the Secretariat of two contributions made in Beijing: the first one by Zhu Muju, Deputy Director-General, Department of Basic Education, Ministry of Education, and the second one by Liu Enshan, Beijing Normal University.

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schools and personalised learning styles, or shall we advocate the integration of formal and non formal education;

- Shall we still take students' academic achievement as the only indicator of assessment, disregarding the various potentials of the students, which leads to the academic failure of most students and their hurt self-esteem and self-confidence, or shall we recognise the existence of multiple intelligence, and take efforts to help students establish active motivation.

The National Education Conference in 1999 made the decision of deepening educational reform and thoroughly carrying forward quality-oriented education. The concept of "quality-oriented education" contains the ideas that, in light of the current background of social development, education should aim at the comprehensive education of students in order for them to suit the social development, promote all students' development and every individual students' full development.

II. The main problems in the Chinese science curriculum

The main problems that have been identified in the current Chinese science curriculum, are the following:

- The curriculum is subject-centred, and knowledge-centred;
- Emphasis is put on science, but not on technology;
- There is an undue stress on knowledge, neglecting the development of the students' ability to apply science knowledge and skills in problem solving;
- The separation into major disciplines does not permit to connect physics, biology, chemistry and earth sciences;
- Recitation of science prevails towards "science as inquiry";
- Teachers fail in developing students' scientific attitude, value, process skills and higher-order thinking skills.

III. Objectives of the curriculum reform underway

The reform is based on the conviction that every students should be a science literacy person; and that every student can study science well. Considering the above-mentioned problems, the specific objectives of the curriculum reform have been determined as follows:

1. To reform the tendency according to which curriculum objectives overemphasise the knowledge transmission. Stress is put on the promotion of every student's healthy development in both physical and emotional aspects, and in the development of their good characters and of their desire and ability of lifelong learning;

2. To reform the tendency according to which the curriculum structure overemphasises the independence of disciplined subjects and that too many subjects are put in it, with lack of

integration. There is thus an effort being made to enforce the comprehensiveness, balance and selection of curriculum structure;

3. To reform the tendency according to which curriculum content overemphasises the strictness of disciplined subjects and classical knowledge. The new reform focuses on the improvement of the relevance of curriculum content with modern society, the development of science and technology and students' life;

4. To reform the tendency according to which non formal education is neglected, by integrating formal education with non formal education in terms of both forms and content;

5. To reform the tendency according to which receptive learning, mechanical memory and passive imitation are overemphasised in the teaching process. Students' various kinds of learning activities such as active participation, exchange and co-operation, and exploring and discovery, will be advocated in order to make the students become real independent learners;

6. To reform the tendency according to which textbooks are separated from students' life experience and fail to meet the specific needs of schools and students in different areas. Students should understand the connections between science, technology and society. The multiplication of textbooks will be enhanced accordingly, and schools will progressively be let to achieve the power of textbook selection;

7. To reform the tendency according to which curriculum assessment overemphasises knowledge memory and stresses its function of selection and identification. Learning in science should depend on actively doing science: it should be a hands-on, minds-on science learning experience. Besides, a new assessment system which is characterised by multiple assessment indicators, multiple assessment manners, and concern with outcome and more stress on the process, is being set up;

8. To reform the overdue centralised curriculum management, by establishing national, local and school level curriculum management policies, designed to ensure the overall quality of basic education as well as to improve its adaptability.

IV. Reform of curriculum structure

a. Principles

In the new curriculum structure of basic education, curriculum should be comprehensive, balanced, and selective:

- The organisation of curriculum content should reflect comprehensiveness, progressively achieving the shift from subjects to areas of study, and form subjects division to subjects integration;

- The design of curriculum structure should follow students' laws of physical and intelligence development, reflect the development of current society, science and technology. Curriculum structure should be balanced by means of establishing reasonable subjects or areas of study and their time allocation;

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- Curriculum structure should be suitable for regional difference, characters of different schools, especially students' individual difference. It should reflect selection.

b. Structure

The main principles of the new structure is briefly described hereunder:

- To take the nine years as a whole in setting up the curriculum in the stage of compulsory education, and to build a curriculum structure that integrates disciplined subject and comprehensive subjects;

- To update educational content on basis of the overall advance of science and technology and the systematic conception of the nature and society; to reduce the number of subjects and give more time and space for self-study and practice;

- To reform and restructure disciplined subjects; to enforce the comprehensiveness of educational content; to weaken the demarcation of subject boundaries; to strengthen the connection with practical life and students' experience, as well as the connection between subjects in knowledge, skill and methods;

- To strengthen the connection of curriculum with society, science, technology, and students' development in order to develop students' creativity and practical ability. Comprehensive practice activity will be established as compulsory courses from primary to upper secondary school. The content of such courses will include research study, community service, labour skills education and other activities of social practice. It is intended to develop students' ability of solving practical problems.

Curriculum at primary schools will be mainly comprehensive courses. In the first two grades, there will be ideological and moral education, comprehensive practice activity, Chinese, Mathematics, sports and health and arts. From grade 3 to grade 6, there will be moral education, comprehensive practice activity, Chinese, Mathematics, society, science sports and health, and arts.

Based on the competence of the teachers, lower secondary schools can choose mainly disciplined courses, including ideological and political studies, Chinese, Mathematics, foreign languages, history, geography, chemistry, biology, sports and health, arts, and comprehensive practice activity. They can also choose mainly comprehensive courses, including ideological and political studies, Chinese, Mathematics, foreign languages, comprehensive humanities, comprehensive science, sports and health, arts, and comprehensive practice activity. Or they can integrate disciplined and comprehensive courses.

There will be mainly disciplined courses at upper secondary schools. At general upper secondary schools, the types of courses should be multiple. There should be different levels of course content and course requirement. Efforts will be made to create conditions for setting up courses of skills type. In addition to ensure the offering of compulsory courses, upper secondary schools should set up various kinds of optional courses in accordance with students' individual difference and development needs of the local community.

V. Priority areas

In the stage of basic education:

- Moral education, environmental and ecological ethics education, should be strengthened; efforts should be made to promote and develop information education, pay greater attention to science and technology education, and set up comprehensive practice activity.

- The development of students' moral behaviour and values in a period of social transformation should be reinforced, and their sense of responsibility for the nation, society and family should be emphasised.

- Environmental and ecological education should be permeated into every course and other non formal education means, and make it become a logical and systematic part of the new educational content.

- Information courses should be set up, to develop students' interests in information technology. Students should better understand and master the fundamental knowledge and skills of information technology. Their ability of using information in their study should be improved. Information technology course will be basically offered at lower secondary schools by 2005.

- Stress should be put on science and technology education and all the primary and secondary school students' competence in science and technology should be enhanced. Special attention should be given to the education to scientific methods, scientific approach, and scientific values, as well as the acquiring of general skills, vocational awareness and pioneering spirit. It is intended to make science and technology a power instrument for improving people's quality of life, resisting superstition, and actively participating in the decision-making of social and scientific matters.

- Comprehensive practice activities should be set up. By means of research study, community service, and social practice activities, they will aim at improving students' learning styles, enriching their learning experience and strengthening the close links of schools and social life.

VI. Six domains in science learning

The new curriculum will encourage students to learn science in six domains :

- *Knowledge domain:* mastering of the important facts, major concepts and principles of science;

- *Science laboratories and operation skills domain:* operational skills, the skills working with apparatus and instruments;

- *Scientific process skills domain*: observation, measurement, grouping, questioning, hypothesis formulation, experimenting, and so on;

- *Application domain:* ability to use concepts and skills in new situations;

- *Creative domain:* quality and quantity of questions, explanations and new ideas;

- *Attitude domain:* positive feeling towards science and studying science.

VII. Reform of teaching process and assessment

1. Teaching process should fully reflect students' continuous development and teachers' continuous development and teachers' continuous improvement. The key point in achieving curriculum objectives and strengthening curriculum reform is to optimise the teaching process based on the concept of quality-oriented education

    - Teachers are organisers and guides of the teaching process. Teachers should cater to all the students, study and get to know every students' need and their potential for development, and conduct their instruction accordingly in a creative way. In designing teaching objectives, selecting curriculum resources, and organising teaching activities, teachers should always aim at quality-oriented education. Teachers should learn, explore and use various ways of instruction organisation and teaching methods: inquiry learning, co-operative learning, solving of daily life problems, role playing, simulation, collecting information, concept mapping, constructivist and STS;

    - Students are masters of their study. Students' development is both the starting point and the end of the teaching activity. Learning should be the basic way to develop students' intelligence and sound characters. In a complete learning process, while students should attain the necessary fundamental knowledge and basic abilities, they should also develop emotion, attitudes, and values. In the teaching process, students should be taught to learn to use different ways of learning for different learning content, and make learning become an active and personalised process;

    - Teaching materials are important media of the teaching content. Textbooks should expand both teachers' and students' development. Inquiry-based teaching materials should be prepared to this aim. They should help guide students' exploration, discovery and challenge, broaden students' perspectives, and enrich their learning experience. In the teaching process, teachers should use the textbooks in a flexible and creative way, and fully utilise various curriculum resources both within and out of schools;

    - Improving communication and exchange between teachers and students is a key element in the teaching process. Teachers should advocate democracy in teaching, establish an equal and co-operative teacher/student relationship, create a desirable climate for students' learning co-operation, and thus create favourable conditions for students' all-round development and healthy growth.

2. Curriculum assessment plays the function of encouragement orientation and quality control in the curriculum system. Through this curriculum reform, we should try to establish an assessment system that promotes students' all-round development,

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encouraged teacher' enterprising spirit, and drives curriculum to be continuously perfected:

- A developmental assessment system has been designed to promote students' development of all-round qualities. Assessment should not only concern with students' development in language and Mathematics logic, it should also find and develop students' potentials in other aspects by means of establishing new assessment indicators and reforming assessment methods. Assessment should fully understand students' developmental needs, concern with their individual difference, help them establish self-conception and self-confidence, and promote every student's development based on their original levels; variety of assessment methods should be used in consequence: paper test, acquiring of information, laboratory work, essay writing, teacher interviews, systematic observation of student performance, and student projects;

- Teacher assessment system emphasises teachers' analysis and improvement of their own teaching behaviour. Establish assessment system which will be mainly dependent on teachers' self-assessment, but in which all principals, teachers, students, and parents will participate. In this way, teachers can get information for improving their teaching behaviour from various sources, and continuously improve their teaching;

- Curriculum development assessment system will regularly analyse and evaluate the conduct of school curriculum programs and the problems in curriculum implementation, revise the curriculum content, improve teaching management, and establish a mechanism for continued curriculum innovation.

VIII. Reform of curriculum management system

In order to measure and promote curriculum adaptability for different regions, schools and students, we will reform the current management model which is too much centralised, and establish a three-level curriculum management system at national, local and school levels. The responsibility at each level will be clearly defined:

- *Responsibility of the Ministry of Education*: to define the nature of basic education and its basic tasks, and stipulate types of curriculum and ratio; to formulate and issue national curriculum standards; to study and formulate assessment system of basic education curriculum; to formulate policies of curriculum management and development;

- *Responsibility of provincial authorities:* to formulate plans of implementation of national curriculum at different educational stages for their respective provinces (autonomous regions and municipalities) in accordance with the requirement of national curriculum programs and the practical local needs. On the basis of national curriculum implementation and relevant regulations issued by the Ministry of Education, to plan, to establish and to develop local curriculum, using the time allocated for local curriculum; to formulate guidelines for schools to implement local curriculum;

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- *Responsibility at school level:* based on the implementation of national and local curriculum, schools should be involved in the planning of specific programs to implement school curriculum in the local community; meanwhile, on the basis of their tradition and strength, and the students' interests and needs, they can develop and select courses suitable for their schools.

Schools have the right and the responsibility to report on the problems in implementing the national and local curriculum, and establish the internal school curriculum assessment system to ensure that curriculum implementation at schools is consistent with the objectives of national and local curriculum.

Through this policy of multi-level curriculum management, it is designed to improve the suitability of curriculum for different regions, schools and students.

Curriculum reform is a complicated systematic program. The time has gone forever for the curriculum reform solely driven by reform of textbooks or any other single aspect. People are more and more aware of the important relationship in which various elements relevant with curriculum reform interact with and restrict each other. Another key element for the success of curriculum reform is teacher training. China is implementing the "Continuous Education Project", in which all the teachers will be trained in turn. This will have a great effect upon teachers' educational thought, new teaching skills, and re-identification of their roles.

Basic education curriculum reform should stress that basic education is intended to lay foundation for people's lifelong development: the students' whole life should become a process of sustainable and effective self-study, and they should adopt proper ways to solve the problems encountered in their life and to demonstrate their unique wisdom. Curriculum reform, therefore, must surmount the goals of specific subjects and must be directed to the goal of students' all-round development.